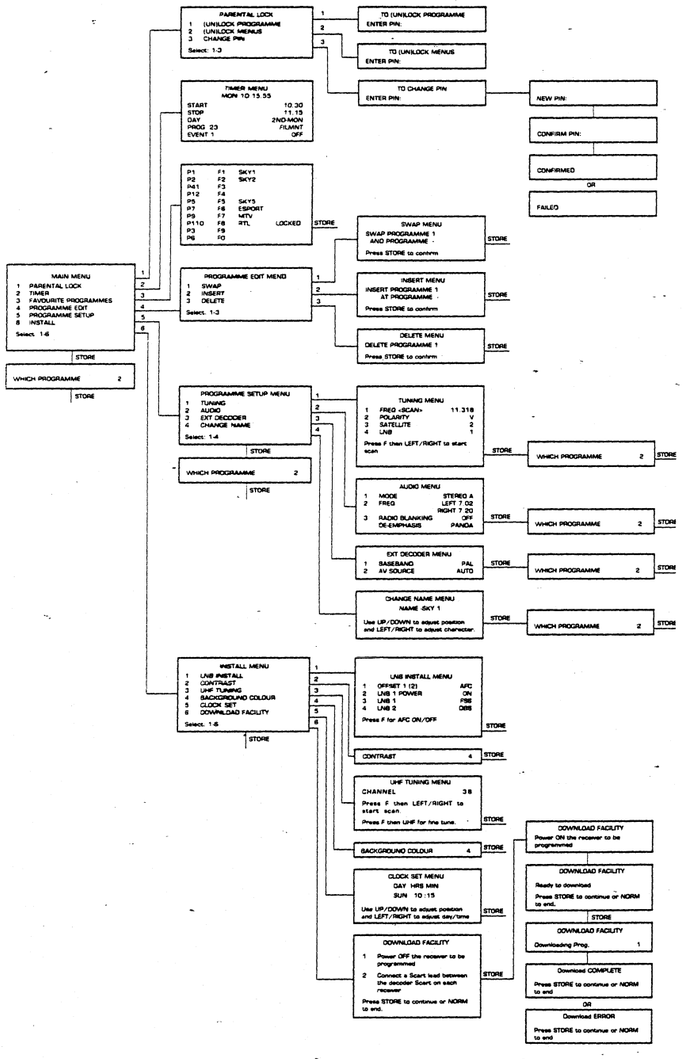
PACE PRD-800

MODEL

SERVICE MANUAL

Menu Structure



VIDEOCRYPT

Not For Publication

Diagram 'C' - Programable Card Reader

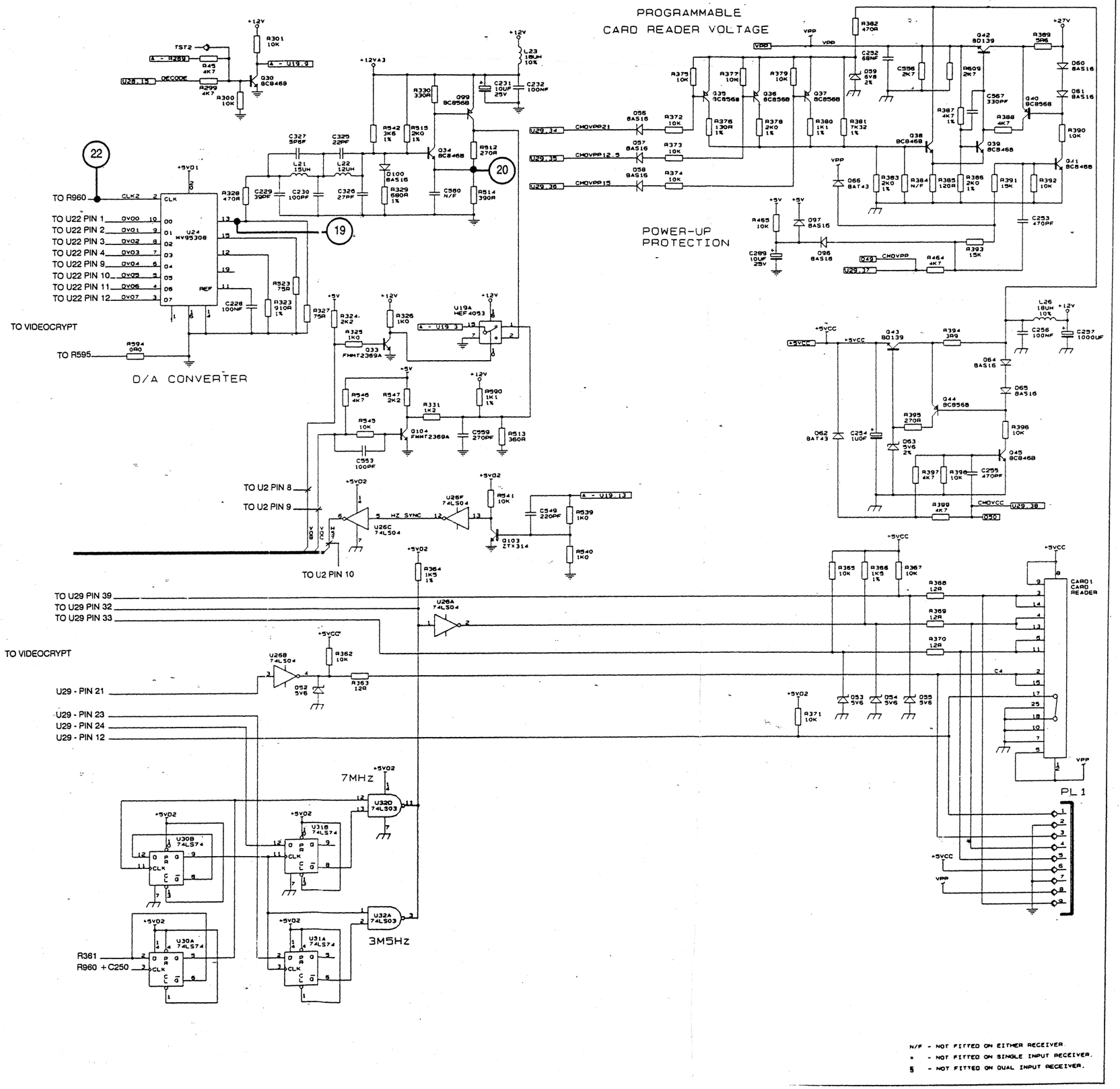


Diagram 'A' - Tuner, Video Processing, Control & UHF Modulator

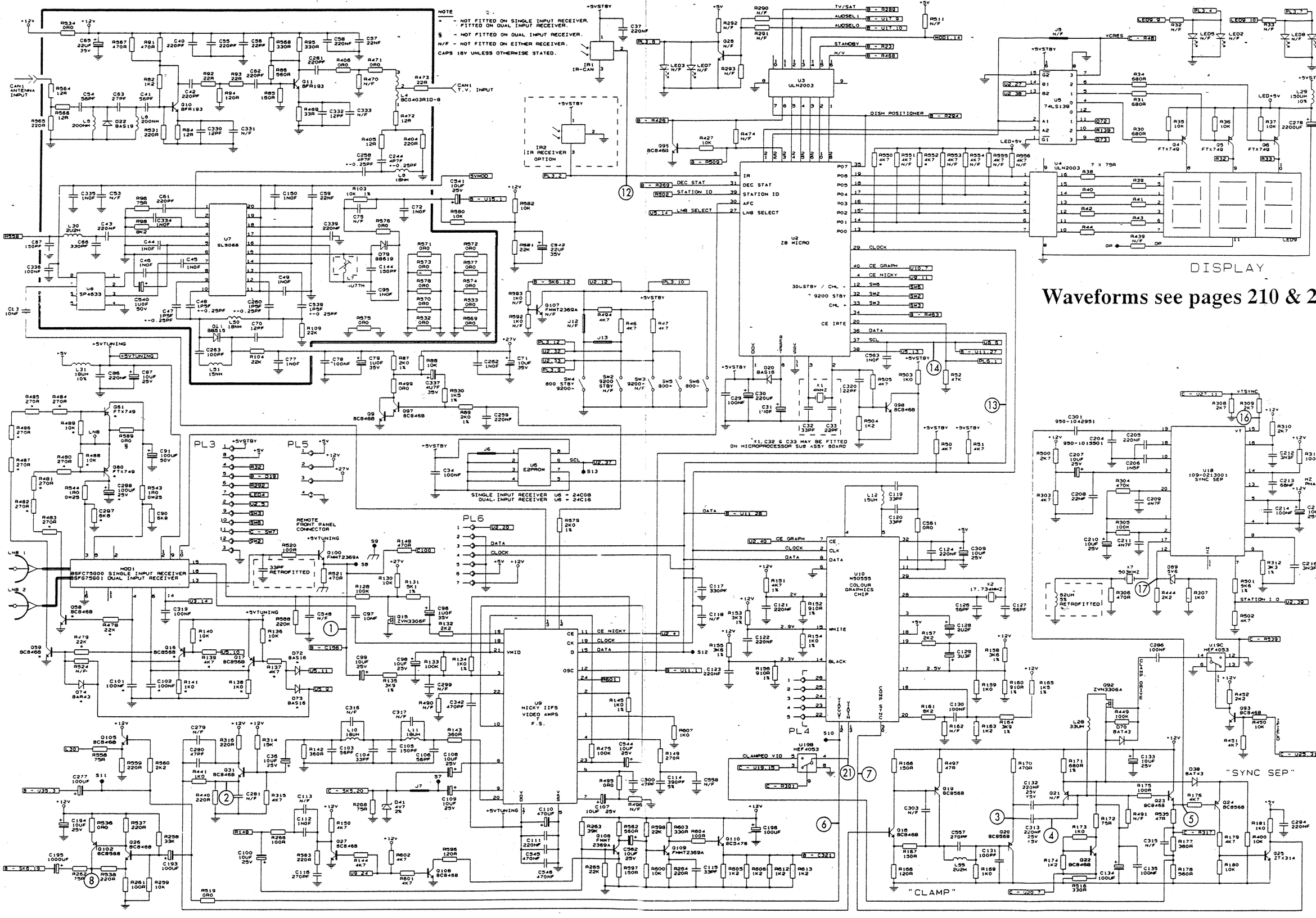
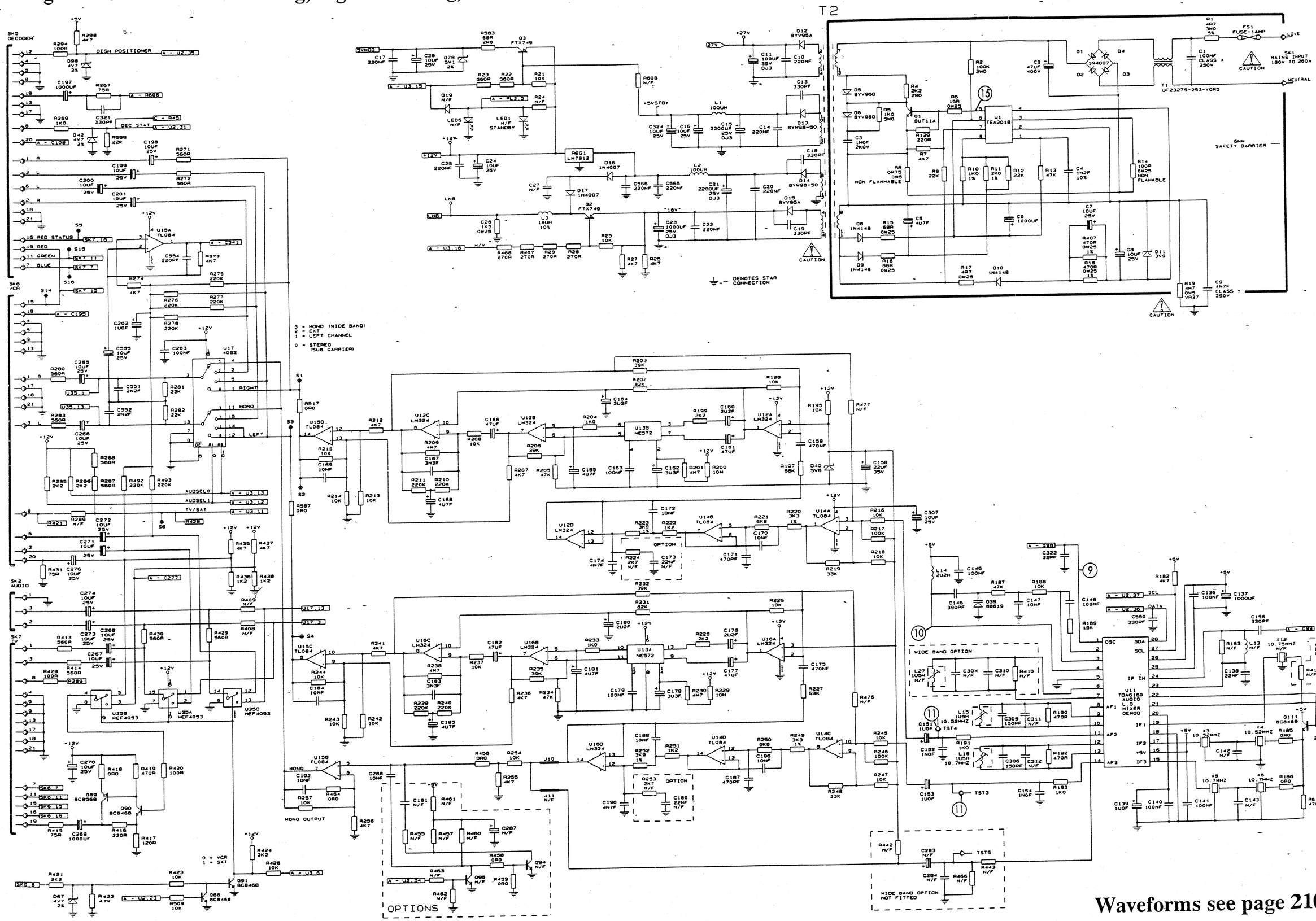


Diagram 'B' - Audio Processing, Signal Routing, Scart & Power Supply



Waveforms see page 210

Waveforms

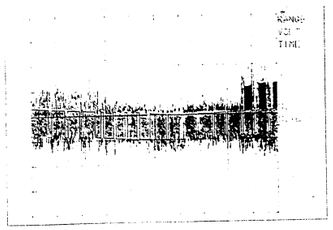
The oscillograms which follow are divided into 5 main sections: Video, Audio, Control, SMPS and VideoCrypt. It is important that, within each of these sections, you check for the presence of the signals in the order they are given (e.g. for the video circuitry you test at points 1 to 8 in that order).

The 26 oscillograms given are numbered sequentially and the appropriate section and circuit diagram letter are also given above each. The oscillogram numbers are marked on the circuit diagrams and the PCB component ident diagrams.

Alongside each oscillogram is a note of where the test is made, a brief description (including any special instructions) and an indication of which components need to be checked if the oscillogram you see on the receiver is not like that shown on the page.

Unless specified otherwise, all the oscillograms have been produced using a DC coupled oscilloscope and have ground at the bottom of the oscillogram.

1. VIDEO — CIRCUIT DIAGRAM A



Test Point: Q100 emitter

Description: AC coupled oscilloscope, 0 V at centre of oscillogram.

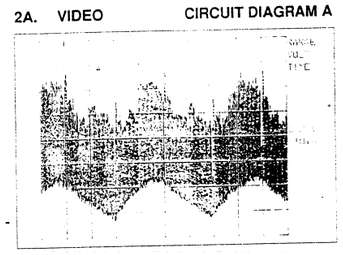
The trace shows tuner output (i.e. totally unfiltered video).

The superimposed line shows, for comparison, the expected trace for filtered video.

If the trace is not as shown, check:

- Q100;
- that the tuning voltage changes when different programmes are selected;
- the prescaler output on pin 18 of MOD1;
- the 4 MHz reference at pin 12 of U9;
- the LNB voltage on pin 5 of MOD1.

2A. VIDEO — CIRCUIT DIAGRAM A



Test Point: Q31 emitter

Description: AC coupled oscilloscope, 0 V at centre of oscillogram.

Traces 2A and 2B both show the normal video signal at point 2, only the time axis is different; there may be slight variations in the trace, depending on picture content.

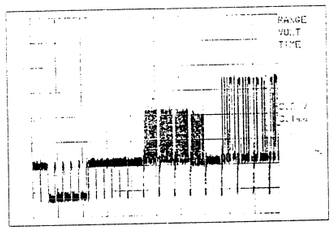
If the trace is not as shown, check:

- the route through U9, i.e. check back from pin 20 through to pin 3 of U9 to check that the trace is as shown. (Consult the circuit description for U9.)

Note that pin 3 of U9 is similar, in effect, to point 1 above.

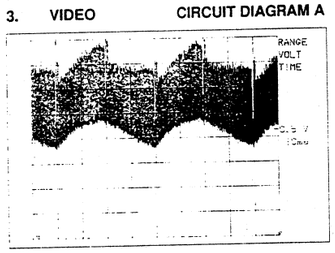
Note that pin 6 of U9 is similar, in effect, to point 1 above, but should give a trace of much larger amplitude (approx. 3 V p-p).

2B. VIDEO — CIRCUIT DIAGRAM A



Test Point: Q31 emitter (see oscillogram 2A above)

3. VIDEO — CIRCUIT DIAGRAM A



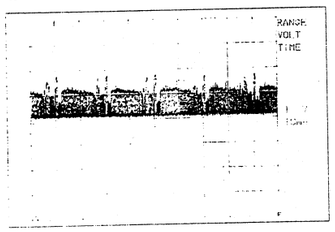
Test Point: Q20 emitter

Description: The trace shows unclamped video of the correct gain. This is the video signal at one side of C132, whereas Oscillogram 4, below, shows the signal at its other side.

If the trace is not as shown, check:

- the gain stage (Q18, Q19 and Q20).

4. VIDEO — CIRCUIT DIAGRAM A



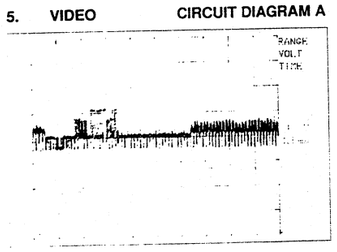
Test Point: Junction of L28 and R175

Description: The trace shows clamped video at the correct DC level. This is the video signal at the opposite side of C132, as compared with Oscillogram 3 above.

If the trace is not as shown, check:

- the horizontal sync. to the gate of Q92.

5. VIDEO — CIRCUIT DIAGRAM A



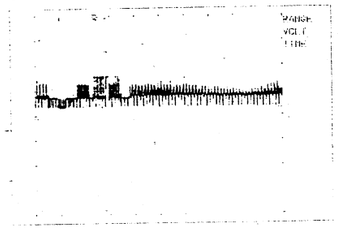
Test Point: Q23 emitter

Description: This trace also shows clamped video; its DC level is important - check the DC level.

If the DC level is not as shown, check:

- Q23 and its associated circuitry.

6A. VIDEO — CIRCUIT DIAGRAM A



Test Point: Pin 12 of U10

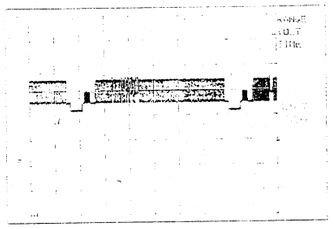
Description: Trace 6A shows the trace you would expect at point 6 when there is a picture on the screen; trace 6B (next oscillogam) shows what to expect at point 6 if there is a plain coloured background with graphics on the screen.

Check for trace 6A. If this is as expected, remove the input and select a plain coloured screen with graphics (e.g. Main Menu) and look for trace 6B.

If the traces are not as shown, check:

- that the composite sync is being fed into pin 30 of U10 (see oscillogram 7).

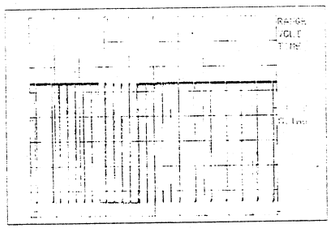
6B. VIDEO — CIRCUIT DIAGRAM A



Test Point: Pin 12 of U10 (see oscillogram 6A)

Description: Trace 6B shows what to expect at point 6 if there is a plain coloured background with graphics on the screen. The graphics can be seen towards the centre of the trace.

7. VIDEO — CIRCUIT DIAGRAM A



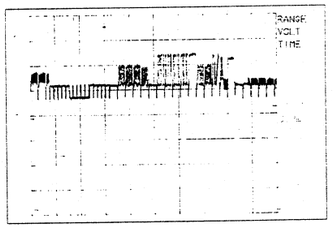
Test Point: Pin 30 of U10

Description: The trace shows the composite sync.

If the trace is not as shown, check:

- Q24, Q25 and associated circuitry.

8. VIDEO — CIRCUIT DIAGRAM A



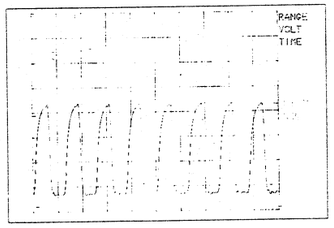
Test Point: Q102 collector (VCR SCART driver)

Description: The trace shows 2 V peak-to-peak of clamped composite video.

If the trace is not as shown or has the wrong amplitude, check:

- Q102, Q26 and associated circuitry.

9. AUDIO — CIRCUIT DIAGRAM B



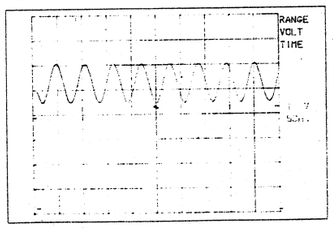
Test Point: Pin 1 of U11

Description: The trace shows the amplitude of the 4 MHz reference.

If the trace is not as shown, check:

- Q98 and associated circuitry.

10. AUDIO — CIRCUIT DIAGRAM B



Test Point: Pin 4 of U11

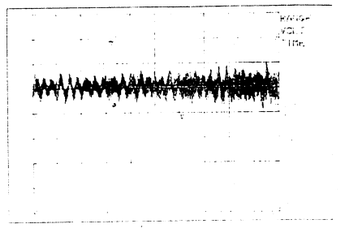
Description: The trace shows an oscillation whose frequency changes as the audio subcarrier is tuned.

Find the test card, select the Mono 1 audio mode and tune between 5 and 9 MHz. The frequency of the trace should change between 15.7 and 19.7 MHz as you do this. Check also that the voltage on pin 3 of U11 changes as the frequency changes.

If the trace is not as shown, check:

- the circuitry associated with pins 2, 3 and 4 of U11.

11. AUDIO — CIRCUIT DIAGRAM B



Test Point: Test point TST3 or TST4

Description: The trace should look similar at both points, as TST3 is associated with the left channel and TST4 with the right.

Check that the audio signal is centred at 2.5 V DC.

Follow the audio signal along the following paths:

- U14 pin 8, U14 pin 14, U16 pin 8 and U15 pin 8 (left channel);
- U14 pin 1, U14 pin 7, U12 pin 8 and U15 pin14 (right channel);
- U16 pin 14, U15 pin 7 for mono.

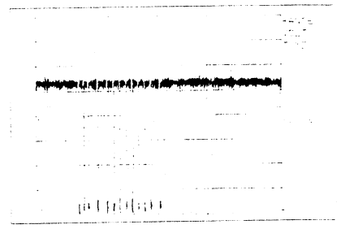
If the signal is not centred at 2.5 V, check:

- U11 and associated circuitry.

If the trace is not as shown at any stage on the path, check:

- the IC at that point on the path or its associated circuitry.

12. CONTROL — CIRCUIT DIAGRAM A



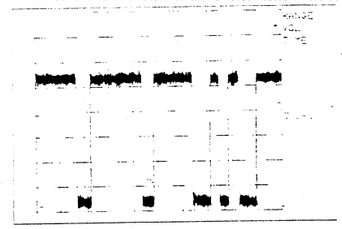
Test Point: Pin 5 of U2

Description: The trace shows typical data out of the IR sensor; press keys on the handset to obtain the trace.

If the trace is not as shown, check:

- the handset;
- IR1.

13. CONTROL — CIRCUIT DIAGRAM A



Test Point: Pin 36 of U2

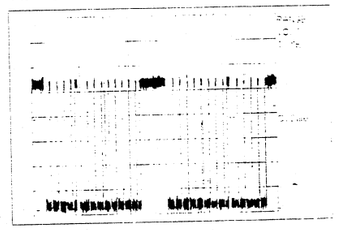
Description: The trace shows a typical serial data (SDA) signal on the I²C bus when the handset keys are pressed to change the programme number.

Press the P-/-- key and/or numeric keys while looking for the trace.

If the trace is not as shown, check:

- U2 and any of the ICs on the I²C bus.

14. CONTROL — CIRCUIT DIAGRAM A



Test Point: Pin 37 of U2

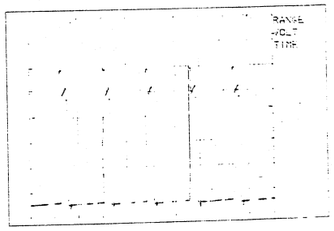
Description: The trace shows a typical serial clock (SCL) signal on the I²C bus when the handset keys are pressed to change the programme number.

Press the P-/-- key and/or numeric keys while looking for the trace.

If the trace is not as shown, check:

- U2 and any of the ICs on the I²C bus.

15. SMPS — CIRCUIT DIAGRAM B



WARNING: While you are making this measurement, you and the oscilloscope must not be earthed. Do not touch any metal parts of the oscilloscope.

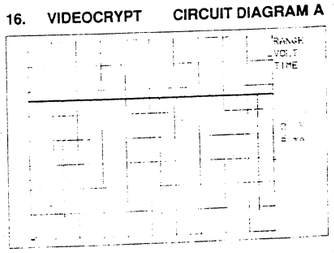
Test Point: Pin 5 of U1

Description: Although the oscilloscope is DC coupled, 0 V is at the centre of the oscillogram. The frequency of the trace will vary with the input voltage and the PSU load.

If the trace is not as shown, TURN OFF THE PSU and check:

- the components in the SMPS circuit.

16. VIDEOCRYPT — CIRCUIT DIAGRAM A



Test Point: Pin 15 of U18

Description: The trace shows the vertical sync. from the sync. sepatator circuitry (20 ms spacing).

If the trace is not as shown, check:

- U18 and associated circuitry.

Waveforms Cont'd

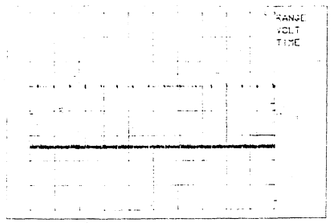
Test Point: Pin 12 of U18

Description: The trace shows the horizontal sync. from the sync. separator circuitry (64 µs spacing).

If the trace is not as shown, check:

- U18 and associated circuitry.

17. VIDEOCRYPT CIRCUIT DIAGRAM A



Test Points: Pins 4, 3, 2, 1, 18, 17, 16, 15 of U20

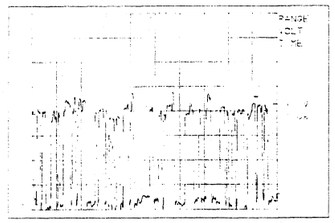
Description: The trace should look similar at all of the above test points, which are the outputs of the ADC.

Check that all 8 bits of data are present (one bit is associated with each of the above pins). Check that the data has a similar appearance by testing at pins 10, 9, 8, 7, 6, 5, 4, 3 respectively of U24 which are the equivalent DAC inputs.

If the trace is not as shown, check:

- the appropriate IC (U20 or U24).

18. VIDEOCRYPT CIRCUIT DIAGRAM C



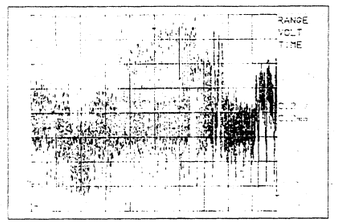
Test Point: Pin 13 of U24

Description: This is the raw video output from the DAC U24.

If the trace is not as shown, check:

- U24.

19. VIDEOCRYPT CIRCUIT DIAGRAM C



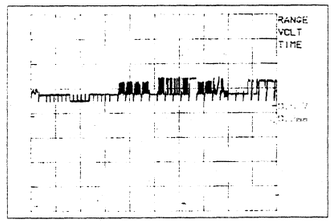
Test Point: Junction of R512 and R514

Description: This is a cleaned up version of the video signal shown in oscillogram 19 above (but note that they have different scales on the vertical axis).

If the trace is not as shown, check:

- Q34 and associated circuitry.

20. VIDEOCRYPT CIRCUIT DIAGRAM C



Test Point: Pin 4 of U19

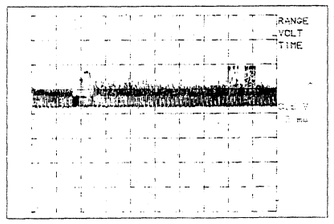
Description: The trace shows the video signal with a scale of 2 ms per division on the time axis. There are three areas of peaks. The first (leftmost) is the vertical sync. and VITS; the other two are the graphics. Oscillogram 21B (see next oscillogram) is a larger scale version of the graphics portion of oscillogram 21A.

The test needs to be carried out when an encrypted programme has been chosen but the viewng card is not inserted (so that graphics messages appear on the screen). Note the voltage level of the inserted graphics.

If the voltage level is not as shown on the trace, check:

- U19A, Q33, Q104 and associated circuitry.

21A. VIDEOCRYPT CIRCUIT DIAGRAM A

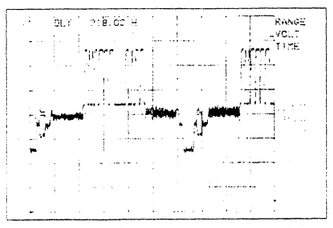


Test Point: Pin 4 of U19

Description: AC coupled oscilloscope, 0 V in centre of oscillogram.

This is a larger scale version of the graphics portion of oscillogram 21A (see preceding oscillogram).

21B. VIDEOCRYPT CIRCUIT DIAGRAM A



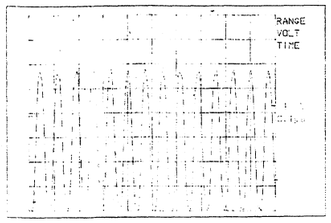
Test Point: Pin 2 of U24

Description: The trace shows the 14 MHz clock signal.

If the trace is not as shown, check:

- that X8 is oscillating at 28 MHz.

22. VIDEOCRYPT CIRCUIT DIAGRAM C



Test Point: Pin 5 of U28

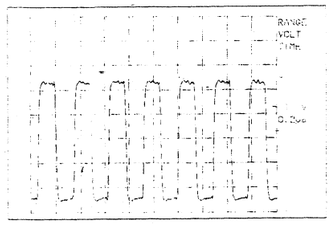
Description: The trace shows the 3.5 MHz clock signal.

If the trace is not as shown, check:

- that there is a 7 MHz signal on pin 5 of U30.

Note that it is not permitted to swap out ICs U25, U27, U28 and U29.

23. VIDEOCRYPT CIRCUIT DIAGRAM C



Late Changes

Changes to Circuit Diagram C

As Circuit Diagram C is printed using special techniques, it went to print before the rest of this manual. The following changes are therefore included in the parts lists in the manual but are not shown on Circuit Diagram C:

- R590 is part of a potential divider used to set the black level on the VideoCrypt graphics. Because this level produced graphics on the grey side, the value of R590 was changed from 1.1 kΩ to 1.2 kΩ (ECO 000368). When, however, ECO S000014 (see below) was implemented, the DC level out of the DAC was affected, causing the black level to go into the sync and thereby causing the VideoCrypt graphics to break up. To solve this problem, R590 was changed back to its original value of 1.1 kΩ (ECO S000026).
- R591 was 22 Ω, but is now 47 Ω, R513 was 360 Ω, but is now 330 Ω and R331 was 1.2 kΩ, but is now 1.5 kΩ 1% (ECO 000368).
- C249 was 2.2 µF 16 V, but is now 10 µF 25 V (ECO 000376).
- C228 was changed from 100 nF to 1 nF and a 1 MΩ, 0.25 W resistor was retrofitted between the +5 V rail and pin 11 of U24 (ECO S000014). This is to cure latchup of the band gap reference in the DAC. The symptoms of this are that, on a VideoCrypt programme, the screen goes black but the VideoCrypt graphics can still be seen and the voltage on pin 11 of U24 is not 1 V.

ECO S000040 details the incorporation (into Revision B1 of the PCB) of two components which will replace the retrofitted 1 MΩ resistor mentioned above and the retrofitted 82 µH inductor shown on Circuit Diagram A. These components are:

- R611 (SMD 1M 0.1W 5% Resistor - Part no. 940-1050501);
- L56 (Axial Inductor - 82 µH 5% - Part no. 130-0820501.

Two ECOs were implemented to improve the performance of the receiver, especially to overcome sparklies:

- C564 is now not fitted (ECO S000010);
- L53 was an RF bead, but is now a 100 Ω 0.25 W resistor
  and L52 was an RF bead, but is now a wire link
  and C340 was 22 pF, but is now 47 pF
  and C250 was not fitted, but is now fitted and is 22 pF
  and R360 was 0 Ω, but is now 100 Ω (all ECO S000026).

Removal of an Earth Loop

It has been discovered that the presence of an earth connection at the LNB connector and a separate earth connection at taptite screw F (see Figure 3 in the section entitled Gaining Access to the Unit) could lead to an earth loop. Such an earth loop can cause thin diagonal lines to appear on the picture, these being mainly noticeable when the receiver is connected using the UHF output (TV connector). A cut has therefore been made in the copper track leading to screw F in order to isolate this point (ECO S000022). Revision B1 of the PCB does not require this cut.

Replacement of Microprocessor Sub-assembly Board by U2

As of 21.11.92, ECOs 0000308, S000030 and S000035 should come into effect. These detail the substitution of the microprocessor sub-assembly board by the dedicated microprocessor U2 (8661 Proc PRD Ser - Part no. 809-8661001). At the same time, crystal X1 will need to move back onto the main PCB, and the following capacitors re-fitted:

- C32 (SMD 33 pF 50V 5% Cer Cog Cap - Part no. 950-3305501);
- C33 (SMD 22 pF 50V 5% Cer Cog Cap - Part no. 950-2205501).

Also, on single input receivers, the IC U6 will need to change to Cat 24C08 8k-Bit serial EEPROM - Part no. 104-0240802.

As of 31.12.92, ECO 000408 should come into effect. This details the change of IC U2 to the following: 8661 Proc PRD Ser - Part no. 809-8661004.

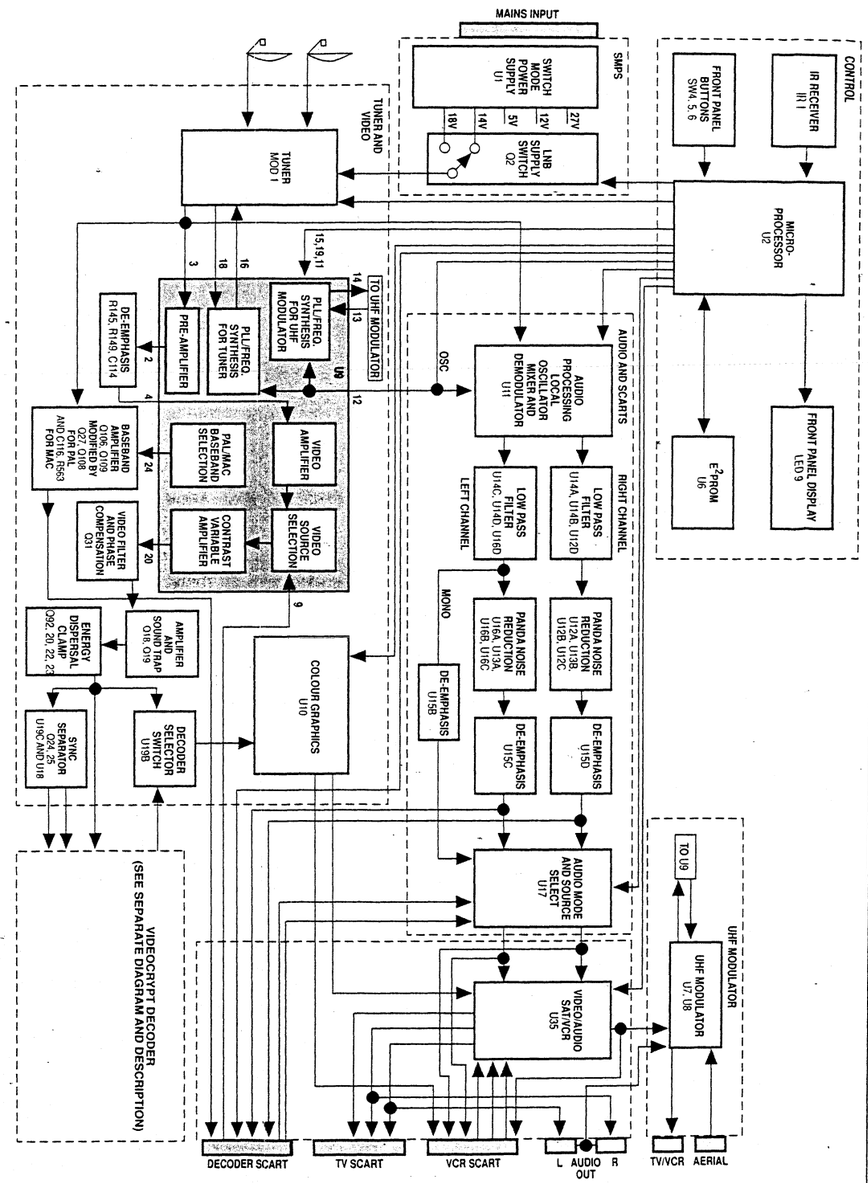
Component Ident Errors

Electrolytic capacitors C166, C182 and C276 have their component ident on the PCB reversed. To take account of this error, each needs to be mounted so that its negative leg (indicated by a black stripe on the capacitor body) is fitted into the hole marked by +, although there are no serious problems if they are left incorrect (ECO S000033 - note that it only applies to board revisions A3 and A5). ECO S000040 details the changes required to the idents to correct the problem for the Revision B1 PCB.

Other Changes

- As of 25.09.92, C10 will become an SMD 47 nF 50 V 10% Cer X7R Cap 0805 - Part no. 950-4735621 because of supply difficulties with the original part (PCO S000003).
- As of 10.11.92, video processing IC U9 will change from Version 2FS to Version 2 (Part no. 109-0960102) as detailed in ECO 000396.
- As of 9.10.92, R583 will become a 82 Ω 3 W 5% M/Film Res (FA85) - Part no. 142-8207511 in order to reduce its operating temperature (ECO 000416).
- As of 16.10.92, the lid of the modulator can will contain a 5.5 mm hole so that the sound coil L7 in the modulator can be adjusted after the lid has been fitted (ECO S000011).
- As of 6.11.92, adjustable coils L15 and L16 will become 10.7 MHz ±3% Adj coil type FH-7 - Part no. 133-2868704; as these include a capacitor, C305 and C306 will no longer be fitted (PCO S000002).

Block Diagram



MODEL-SPECIFIC INFORMATION

ELECTRICAL PARTS UNIQUE TO PACE

	U2 SOCKET 20 WAY TOP ENTRY (HARWIN)	161-2002001
LED 9	3-UNIT 7-SEG DISPLAY RED	200-7030101
MOD1	BSFC77G01 2GHZ S/LNB 'F'TUNER SHARP 22CC	221-2077011
SW4	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW5	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW6	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW7	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
U6	24C08 8K EE (EXEL)	104-0240801

ELECTRICAL PARTS UNIQUE TO PACE

	U2 SOCKET 20 WAY TOP ENTRY (HARWIN)	161-2002001
LED 9	3-UNIT 7-SEG DISPLAY RED	200-7030101
MOD1	BSFG77G01 2GHZ D/LNB 'F'TUNER SHARP 22CC	221-2177011
SW4	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW5	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW6	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
SW7	SWITCH-B3F3152 PCB SUBMIN 150GM (YELL)	204-0315211
U6	24C16 16K EE (EXEL)	104-0241601

PARTS FOR U2 EXTENSION PCB FOR PACE

C3	100NF 50V 5MM M/LAYER CER.CAP TR	157-1045751
C4	100NF 50V 5MM M/LAYER CER.CAP TR	157-1045751
C5	33PF 16V 5MMCERAMIC CAP 10% TR	150-3301651
C6	33PF 16V 5MMCERAMIC CAP 10% TR	150-3301651
	INS.WASHER-FOR HC18/49 (HOLED) X1 CAN	208-0153000
PL 1	PIN HEADER-20 WAY EXT'D S/ROW(HARWIN)	161-1002001
	REV A1 PCB-OTP 800 SERIES REV A1	182-0185101
U1	SMD IC-Z86C9620VSC ROMLESS Z8	904-0869601
U3	74LS374 OCTAL D TYPE LATCH	101-0037400
U4	EPROM-27256 PACE PSR ONLY(VER 2)	305-0800103
X1	CRYSTAL-4MHZ HC18U 50/50/-10+60 30PF PAR	170-0040000

MECHANICAL PARTS UNIQUE TO PACE

1 OFF	BASE-800 UNIV.PRE-COAT PRINT.(NON-PANDA)	321-0800103
1 OFF	CARTON-800 SERIES	412-0078900
2 OFF	POLYSTYRENE 700/800/900 SERIES	442-7890001
1 OFF	MANUAL PRD/PSR/800/900 PACE	502-0800101
1 OFF	REG.CARD-MULTILINGUAL SS6060/9000	504-6900000
1 OFF	HANDSET 800/900 SERIES PACE SMK	699-0800100
2 OFF	PLASTITE SCREW-4 X 1/4 POZI PAN BLACK	245-4140011
1 OFF	COVER-700/800/900 SERIES (GREY) HITMET	312-7890010
2 OFF	PILLAR-LCBS-14 (RICHCO)	248-0014002
2 OFF	PILLAR-SP1-6-01 STAND-OFF (RICHCO)	248-1601001
1 OFF	HALF NUT-3/8 FORM 32 TOI.2A	240-1380011
1 OFF	*A* MAINS CABLE-EURO "8" + PLUG SS9000	191-2015280
1 OFF	BLANKING GROMMET FOR S/LNB OPTION	306-7890000
1 OFF	PSR800/900 PROG LISTING SHEET	504-0800100
1 OFF	PSR800 BAR CODE LABEL 2 PART (638-0800100)	297-1002102
1 OFF	PSR800 FRONT PANEL PRINTED + DOOR TEXT	360-0800101

MECHANICAL PARTS UNIQUE TO PACE

1 OFF	BASE-800 UNIV.PRE-COAT PRINT.(NON-PANDA)	321-0800103
1 OFF	CARTON-800 SERIES	412-0078900
2 OFF	POLYSTYRENE 700/800/900 SERIES	442-7890001
1 OFF	MANUAL PRD/PSR/800/900 PACE	502-0800101
1 OFF	REG.CARD-MULTILINGUAL SS6060/9000	504-6900000
1 OFF	HANDSET 800/900 SERIES PACE SMK	699-0800100
2 OFF	PLASTITE SCREW-4 X 1/4 POZI PAN BLACK	245-4140011
1 OFF	COVER-700/800/900 SERIES (GREY) HITMET	312-7890010
2 OFF	PILLAR-LCBS-14 (RICHCO)	248-0014002
2 OFF	PILLAR-SP1-6-01 STAND-OFF (RICHCO)	248-1601001
1 OFF	*A* MAINS CABLE-EURO "8" + PLUG SS9000	191-2015280
1 OFF	PSR800/900 PROG LISTING SHEET	504-0800100
1 OFF	PSR900 BAR CODE LABEL 2 PART (638-1900100)	297-1002302
1 OFF	PSR900 FRONT PANEL PRINTED OPTION 1	360-0900100